IN THE DRAWINGS

New corrected drawings in compliance with 37 C.F.R. 1.121(d) are included herewith. The corrected drawings are formal and therefore of sufficient quality and standards for publication. No changes have been made to the content of the drawings.

REMARKS

Applicant has submitted formal drawings in response to the Examiner's requirement. No changes have been made to the content of the drawings. Also, applicant has canceled without prejudice claims 26-28 in response to the Examiner's finalizing of the Restriction Requirement.

No amendments have been made to claims 1-25. New claims 29-31 have been added to cover a portion of the invention not previously specifically included in the claims. No additional fees are required since the total number of claims equals the number originally filed. Reconsideration is respectfully requested in light of the remarks included below.

35 U.S.C. 102(b) REJECTION

Claims 1, 2, 9, 13, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Tabuchi U.S.P. 5,764,832. Applicant respectfully traverses this rejection.

First and foremost, it should be noted that Tabuchi does not disclose a high speed data interconnect. Tabuchi simply discloses "an assembly technique for optical components, optical fibers, and electronic components." (Tabuchi specification, column 1, lines 12-14.) The problem addressed by Tabuchi and, therefore the teaching presented to those skilled in the art, is the alignment of an optical fiber with an optical component. (Tabuchi specification, column 1, lines 16-67.)

Further, Tabuchi makes it eminently clear that part 1a is a semiconductor substrate and has nothing to do with stiffening or coefficients of thermal expansion. The only place he suggests strengthening or stiffening is in column 16, lines 6-8 where he states "In this embodiment, since there is the thick Si film 1b, the mechanical strength of the film above the V-groove 2a becomes greater." It is well known in the art that the problem of high speed data interconnect does not occur between circuits as long as the circuits are all integrated on a single substrate. The

problem occurs chiefly when transferring data from one integrated circuit to another (e.g. chip-to-chip or printed circuit board to printed circuit board), as described by applicant in his specification at pages 1 and 2.

Anyone skilled in the art knows there is a great difference between printed circuit boards and semiconductor substrates, not only in cost and workability, but in size and use. Semiconductor substrates are used in the fabrication of single components and even integrated circuits but never for mounting and interconnecting multiple integrated circuits. Clearly, the difference between printed circuit board laminate and a semiconductor substrate is substantial and cannot be overlooked. Further, one skilled in the art would not even consider using a semiconductor substrate as a stiffening plate in a printed circuit board, because of the cost, size, and fragility.

Applicant's claim 1 is the only independent claim in this group and it specifically requires a stiffening plate with optical fiber mounting groove defined on a surface thereof, a length of optical fiber mounted in the groove, and a printed circuit board laminate encasing the stiffening plate and the optical fiber. Applicant believes it is clear from this language that the stiffening plate is included to support and stiffen the optical fiber in the printed circuit board laminate. Further, on page 16, lines 1-4, of

applicant's specification it is clearly explained that "a printed circuit board laminate 50 is applied to stiffening plate 16, both upper and lower surfaces, to encase stiffening plate 16 and optical fiber 14."

The Examiner suggests that films 1b and 3e of Tabuchi form a laminate layer as required by applicant's claim 1. However, if semiconductor substrate 1a of Tabuchi is the stiffening plate then films 1b and 3e could not possibly be considered to be "a printed circuit board laminate encasing the stiffening plate and the optical fiber" as required by applicants' claim 1. Si film 1b and SiO2 film 3e are simply grown on the surface of substrate 1a using normal semiconductor processing procedures. (Tabuchi specification, column 15, lines 57-61.) No "encasing" is disclosed, contemplated, or suggested. Films 1b and 3e never could encase the stiffening plate to form a complete printed circuit board as described and claimed by applicant (see for example applicant's FIG. 9).

Taking all of the limitations of claim 1 as a whole, it is clear that claim 1 cannot be read on the structure or disclosure of Tabuchi, as must be done to anticipate the invention. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. V. Union Oil Co. of California*, 2 USPQ2d 1051, 1053, (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). "All words in a claim must be considered in judging patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 165 USPQ 494. 496 (CCPA 1970). Tabuchi's device and applicant's device claimed in claim 1 are completely different structures, have different uses, and perform different functions. Thus, the device disclosed by applicant in claim 1 and the device disclosed by Tabuchi cannot be the same invention as required by 35 U. S. C. 102(b) and Tabuchi does not anticipate applicant's invention as claimed in claims 1, 2, 9, 13, and 16.

35 U.S.C. 103(a) REJECTION

Claims 3-8, 10-12, 14, 15, and 17-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tabuchi U.S.P. 5,764,832, and further in view of Kosemura U.S.P. 6,330,377. Applicant respectfully traverses this rejection.

For all of the reasons set out above, Tabuchi does not disclose a high speed data interconnect. Further, he does not disclose an interconnect that includes a stiffening plate and a printed circuit laminate encasing the stiffening plate and the optical fiber. Also, applicant agrees with the Examiner that Tabuchi does not explicitly teach an emitter and receiver on a common printed circuit board laminate.

Applicant does not believe that the teachings or structure of Kosemura can be combined with the teachings or structure of Tabuchi to arrive at applicant's claimed structure. For example, Kosemura teaches a multilayer substrate 10 with an optical waveguide 22 mounted on the bottom surface. No "stiffening plate" is included and probably could not be, since it would have to be between layers to be "encased" as required by the claims, and Kosemura teaches "a wiring layer for electrically connecting various electronic parts is formed between the upper and

lower surfaces of multilayer substrate 10 and between insulating layers thereof and moreover these wiring layers are connected via the via holes formed to each insulating layer to totally form the multilayer wiring structure as a whole." (Kosemura specification, column 11, lines 13-19.)

Clearly, neither Tabuchi nor Kosemura, individually, teach the claimed structure including a stiffening plate and optical fiber encased in printed circuit board laminate. This is a substantial feature that adds great advantages to the structure and cannot be ignored. For example, at page 16, lines 22-24, applicant explains that "This printed circuit board concept allows other supporting semiconductor dies to be mounted and interconnected … ." Further, the stiffening plate not only protects the optical fiber from physical damage but prevents relative movement due to unequal thermal expansions and the like as explained on page 10, lines 10-21. These are substantial advantages that are not included or taught in either Tabuchi or Kosemura.

With these advantages in mind, applicant does not believe that Tabuchi teaches a stiffening plate with optical fiber mounting groove defined on a surface thereof, a length of optical fiber mounted in the groove, and a printed circuit board laminate encasing the stiffening plate and the optical fiber as claimed. Further, the teachings of Kosemura would not suggest such structure to one skilled in

the art. Thus, applicant believes that claims 3-8, 10-12, 14, 15, and 17-25 are patentable over any proper combination of Tabuchi and Kosemura.

New claims 29-31 have been added to set forth in more detail the incasing of a stiffening plate in a printed circuit board that has a coefficient of thermal expansion approximately matching a coefficient of thermal expansion of the optical fiber for reducing relative movement between the stiffening plate and the optical fiber and substantially eliminating stress in the optical fiber. Here it should be noted that the stiffening plate also has a Modulus of Elasticity much greater than that of the laminate so that it constrains movement of the top surface of the laminate to which the optical devices are attached maintaining the optical devices positional accuracy. (Stafford spec., page 18, lines 1-9.) The constraint of the surface to which the optical device is attached ensures the optical devices maintain their coupling efficiency during thermal excursions. Applicant has specifically claimed this feature in claim 31. Applicant believes that these features are clearly patentable over any teaching of Tabuchi and Kosemura.

It should be noted that dependent claims 5, 6, 16, 17, 19, 20, 24, and 25 all deal with the coefficient of thermal

expansion problem dealt with specifically in claims 29-31. Thus, the addition of claims 29-31 is not a new feature or amendment that would require additional searching and would not allow a Final Rejection in the event that new art is cited.

Should there be any questions or remaining issues regarding the foregoing, Examiner is cordially invited to telephone the undersigned attorney for a speedy resolution.

Respectfully submitted,

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24 February 2006

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